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Key to Improve Accuracy: Tighter Gun Tube Specs

Dear Sir:

Major Held's article, "Zeroing In," from the May-June 1995 issue, has done a good job of highlighting the issues the Armor community must consider when selecting or modifying tank gun calibration procedures. A key element of Total Quality Management is continuous improvement, and improving hitting probability certainly is a worthwhile goal. This policy decision is ultimately one to be made by the user, within the constraints of cost and complexity, based on the best information available.

The performance of the 120mm gun system during Desert Storm would appear to provide a measure of effectiveness of the current policy. There is always the question "Can we do better?" As Major Held suggests, to make rational decisions one must know the relative magnitude of the individual error sources and the cost of correcting that error.

Current calibration policy has its genesis in a pioneering series of user tests and experiments carried out by the Armor and Engineer Board during the 1970s. The principal investigators were (then) Captains Jim Brown and Bob Kloecker with analytical support by Dr. Charlie Leake. The effort began with a complete analysis of various boresighting schemes and progressed through the characterization of boresight/zero relationships.

These tests, and subsequent tests involving the 120mm gun, clearly demonstrated that *the major source of tank-to-tank variability is the gun tube.* The variance is most pronounced when firing the more energetic rounds. Two of the possible alternatives proposed by MAJ Held (Surrogate Zero and Silent Zero) deal exclusively with gun-to-gun variabilities.

As an alternative to producing guns which have operationally significant variances in point of impact and requiring the user to compensate, I would suggest that the variances be addressed directly by the addition of an accuracy performance or acceptance specification for the gun tube.

For a number of years, the procurement specification for tank gun ammunition has included a performance requirement in terms of allowable round-to-round dispersion. Each lot of ammunition is required to demonstrate that it meets this requirement.

The specification for the tank gun is stated only in terms of manufacturing requirements. Tolerances, hardness, and finishes are specified, but there is no stated performance requirement. More importantly, scientific relationships between manufacturing specifications and fall of shot are essentially unknowns.

A performance specification which required all guns to shoot uniformly would ensure that the user can continue to use the simple and effective fleet zero policy. This sort of requirement places demands for uniformity of manufacturing on the producer. Given the number of years of U.S. 120mm gun manufacturing, it is entirely reasonable to expect that this level of process repeatability is achievable.

The following is offered as a strawman criteria. "The gun in a fixed mount will be boresighted using the troop issue boresight at a target placed at 1000 meters. After boresighting any ammunition-unique corrections will be applied, i.e., superelevation and jump. Five rounds of service APFSDS (normally the most energetic round) fired at the target shall demonstrate a mean center of impact (MCI) not more than .35 mils from the expected point of impact.

MAJ Held has done real service to the community by presenting the issues. Hopefully, the Armor community and its developer friends can work together to accomplish continuous improvement.

RICHARD F. PELL
COL, Armor, Retired

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For technical questions on this web page, send email to Dave Nilsen